Preoperative Cardiac Evaluation
Prior to Noncardiac Surgery

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Overview

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• Preoperative estimation of cardiac risk
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• Procedure timing
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<th>Abbreviations</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACC:</td>
<td>American College of Cardiology</td>
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<tr>
<td>AHA:</td>
<td>American Heart Association</td>
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<td>ASA:</td>
<td>American Society of Anesthesiologists</td>
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<tr>
<td>NICE:</td>
<td>National Institute for Health and Care Excellence</td>
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<tr>
<td>MACE:</td>
<td>Major adverse cardiac event(s)</td>
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<tr>
<td>RCRI:</td>
<td>Revised Cardiac Risk Index</td>
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<tr>
<td>ACS NSQIP:</td>
<td>American College of Surgeons National Surgical Quality Improvement Program</td>
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<tr>
<td>ACS:</td>
<td>Acute coronary syndrome</td>
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<td>PCI:</td>
<td>Percutaneous coronary intervention</td>
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<td>DAPT:</td>
<td>Duel antiplatelet therapy</td>
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Learning Objectives

1. List patient characteristics that increase risk of perioperative MACE.
2. Categorize procedures into high-risk or non-high risk.
3. Estimate individual patients’ cardiac risk using the RCRI.
4. Estimate individual patients’ cardiac risk using the ACS NSQIP online risk calculator.

Learning Objectives (cont.)

5. Discuss optimal timing of elective noncardiac surgery after ACS or PCI.
Preoperative Cardiac Evaluation

Introduction

• > 50 million surgeries in the US annually
• 1.4 – 3.9% of surgeries in the US are complicated by a major perioperative cardiac event
• Cardiac complications are the most common cause of postoperative morbidity and mortality
• Two major determinants of surgical outcomes:
  • Procedure type
  • Patient characteristics

Preoperative Cardiac Evaluation

Procedure risk

2014 ACC/AHA Guidelines divide procedures into only two categories:

• Low:
  • Procedure wherein the combined surgical and patient characteristics predict a risk of MACE < 1%
  • e.g. cataract surgery, endoscopy
• Elevated:
  • Procedure wherein the combined surgical and patient characteristics predict a risk of MACE ≥ 1%
  • e.g. open and vascular procedures
Preoperative Cardiac Evaluation

Preoperative cardiac risk estimation

ACC/AHA recommends use of one of the following cardiac risk estimation tools:

- Revised Cardiac Risk Index (RCRI)
- ACS NSQPI Surgical Risk Calculator

Revised Cardiac Risk Index\(^7\)

<table>
<thead>
<tr>
<th>Two or more of the following risk factors make a patient “high risk.”</th>
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<tr>
<td>High-risk surgery (intraperitoneal, intrathoracic, or supra-inguinal vascular procedures)</td>
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<tr>
<td>History of ischemic heart disease</td>
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<tr>
<td>History of congestive heart failure</td>
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<tr>
<td>History of cerebrovascular disease</td>
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<td>Preoperative treatment with insulin</td>
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<td>Preoperative serum creatinine &gt;2.0 mg/dL</td>
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</table>
Preoperative Cardiac Evaluation

Preoperative risk estimation (cont.)

ACS NSQPI Surgical Risk Calculator:

- 22 questions (about patient (including ASA class) and planned procedure)
- Online: [http://riskcalculator.facs.org/](http://riskcalculator.facs.org/)

Preoperative Cardiac Evaluation

Preoperative risk estimation (cont.)

ASA Classification:

1: Healthy patient
2: Mild systemic disease
3: Severe systemic disease
4: Severe systemic disease / constant threat to life
5: Moribund / not expected to survive surgery
Preoperative Cardiac Evaluation

Stepwise preoperative evaluation

Once the patient’s perioperative risk for MACE has been estimated using one of the preceding methods, this information can be used in one of the following algorithms:
Preoperative evaluation algorithm

Conditions requiring specialist evaluation:
- Moderate or greater valvular stenosis/ regurgitation
- Cardiac implantable electronic device
- Pulmonary hypertension
- Congenital heart disease
- Severe systemic disease

Yes

Consult Cardiology or specialist for evaluation

No

Complete RCRI or ACS NSQIP cardiac risk calculator.
High cardiac risk? (RCRI >1 or ACS NSQIP >1%)

Yes

Assess functional status

No

Optimize preventive care:

Assess functional status. Can patient complete >4 METS?
- Sexual relations
- Climbing a flight of stairs
- Moderate recreational activities (golf, bowling, dancing)
- Yard work (raking leaves, weeding, pushing power mower)
- Throwing a baseball or football
- Walking up a hill
- Doubles tennis

Yes

Optimize preventive care:
- Hypertension per ACC/AHA guidelines
- Cholesterol per ACC/AHA guidelines
- Sleep apnea history or STOP-Bang >3
- Smoking cessation

No

Consider Cardiology consultation for pharmacologic stress testing

Recommend perioperative medication management.
Review ACS NSQIP risk estimates with patient.

Refer to surgery
STOP-Bang screening tool for obstructive sleep apnea

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<tr>
<th>S</th>
<th>Snoring</th>
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<tbody>
<tr>
<td>T</td>
<td>Tiredness</td>
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<tr>
<td>O</td>
<td>Observed apnea</td>
</tr>
<tr>
<td>P</td>
<td>High blood pressure</td>
</tr>
<tr>
<td>B</td>
<td>Body mass index &gt;35 kg/m²</td>
</tr>
<tr>
<td>A</td>
<td>Age &gt;50 years</td>
</tr>
<tr>
<td>N</td>
<td>Neck circumference &gt;40 cm</td>
</tr>
<tr>
<td>G</td>
<td>Male gender</td>
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</table>

**Scoring:**

- 0-3 Low risk
- 4+ High risk

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*CENTRAL ILLUSTRATION* Stepwise Perioperative Cardiac Risk When Considering Noncardiac Surgery

- Patient
- Needs emergency noncardiac surgery
- Needs elective noncardiac surgery
- Exhibits evidence of acute coronary syndrome
- No evidence of ongoing ACS

**Perioperative risk for MACE* > 1%**

- Functional capacity: Unknown
- Poor
- Moderate
- Good
- Excellent

**Perioperative risk for MACE* > 1%**

- Proceed to surgery
- Proceed to ACS evaluation
- Consider non-invasive testing if results would change management
- Consider non-invasive testing if results would change management
- Proceed to surgery
- Proceed to surgery

* Estimate major adverse cardiac event risk using:
  - American College of Surgeons National Surgical Quality Improvement Program Surgical Risk Calculator
  - Revised Cardiac Risk Index, which takes into consideration these factors:
    - High-risk surgery
    - History of ischemic heart disease
    - History of congestive heart failure
    - History of cerebrovascular disease
    - Pre-operative treatment with insulin
    - Pre-operative mean systolic blood pressure >160 mm Hg

**References**

Preoperative Cardiac Evaluation

Preoperative cardiac testing

ACC/AHA recommends *against* using the following cardiac tests in the following situations (class III):

- **12-lead EKG**
  - Routine preoperative EKG is *not* useful for asymptomatic patients undergoing low risk procedures.

- **Assessment of left ventricular (LV) function**
  - Routine preoperative evaluation of LV function is *not recommended*.

(cont.)

Preoperative Cardiac Evaluation

Preoperative cardiac testing (cont.)

ACC/AHA recommends *against* using the following cardiac tests in the following situations (class III):

- **Exercise or pharmacologic stress testing**
  - Routine stress testing is *not* useful for patients at low perioperative risk for MACE
  - Routine stress testing is *not* useful for patients undergoing low-risk procedures

- **Preoperative coronary angiography**
  - Routine preoperative coronary angiography is *not recommended*
Preoperative Cardiac Evaluation

**Procedure timing**

Elective noncardiac surgery should be delayed following:

- **ACS**
  - 2014 ACC/AHA Guidelines: minimum 60 day interval between ACS and elective noncardiac surgery.

- **PCI**
  - Recommended time delay depends on presence and type of stent implanted.

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Supplemental Figure 1: Guideline Recommendations On Timing of Non-cardiac Surgery Post-PCI

- **Post-PCI patients referred for elective NCS**
  - **BMS**
    - NCS<30d
    - NCS>30d
  - **DES**
    - NCS<3m
    - NCS>3-6m
    - NCS>6m

PCI: percutaneous coronary intervention; NCS: non-cardiac surgery and procedures; BMS: bare-metal stents; DES: drug-eluting stents; d: days; m: months. Figure adapted from 2016 ACC/AHA Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients With Coronary Artery Disease. Green color box indicates class III guideline recommendation or harm, yellow indicates IIb and green indicates class I recommendation.
Summary

• Estimation of patients’ cardiac risk is a key component of preoperative evaluation prior to elective noncardiac surgery.

• Patients undergoing low-risk procedures usually do not require preoperative cardiac testing.

• Patients at low-risk for MACE (as determined by the RCRI or the ACS NSQIP Surgical Risk Calculator) may proceed with surgery without further cardiac testing.

• Elective noncardiac surgery should be delayed following ACS and/or PCI.

References


(cont.)


Preoperative Cardiac Evaluation

References (cont.)
